Atlantic Richfield Company

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Lynda Deschambault
Remedial Project Manager, Superfund Division
U.S. Environmental Protection Agency, Region 9
75 Hawthorne Street, 10th Floor (SFD 7-1)
San Francisco, California 94105

Subject: **Preliminary *In Vitro* Bioaccessibility Testing**
Leviathan Mine Site
Alpine County, California

Dear Ms. Deschambault:

Atlantic Richfield Company (Atlantic Richfield) submits this letter to inform the U.S. Environmental Protection Agency (U.S. EPA) that it will be conducting preliminary *in vitro* bioaccessibility (IVBA) testing on select existing floodplain soil samples. The results will be used to assess whether a more comprehensive IVBA testing program should be completed as part of the Leviathan Mine Site Remedial Investigation/Feasibility Study (RI/FS) and risk assessments, and also whether *in vivo* bioavailability testing for certain metals could provide information useful to the risk assessment process.

Atlantic Richfield will submit nine shallow (0 to 0.5 ft. bgs) floodplain soil samples (Figure 1), that are currently in storage at a project laboratory, to ACZ Laboratories in Steamboat Springs Colorado for bioaccessibility analysis using U.S. EPA Method 1340/9200.2 and total metals using U.S. EPA Method 6010B/6020C. Testing will be completed before holding times expire. Samples to be included in this preliminary analysis were selected to represent a range of metals concentrations from samples within holding times and with sufficient sample volume available. The initial testing will be conducted for lead, arsenic, and seven other RI/FS metals: antimony, barium, copper, iron, manganese, selenium, and thallium. Target analytes were selected as those with concentrations in mine waste samples that exceed residential screening levels.

In 2007, U.S. EPA issued guidance on the use of bioaccessibility data generated from *in vitro* extraction to estimate the relative oral bioavailability (RBA) of lead from soils and sediments in risk assessment (U.S. EPA 2007a,[1]b[2]). The "RBA Leaching Procedure or "RBALP" is described

[1] U.S.EPA. 2007. Estimation of relative bioavailability of lead in soil and soil-like materials using in vivo and in vitro methods. OSWER 9285.7-77, May.
[2] U.S. EPA, 2007, Guidance for Evaluating the Oral Bioavailability of Metals in Soils for Use in Human Health Risk Assessment, OSWER 9285.7-80, May.

in the U. S. EPA Standard Operating Procedure 9200.2-86 (U.S. EPA 2012[3]). U.S. EPA also recently funded a meta-analysis of the data from three arsenic bioaccessibility studies using this method, which concluded that that the study "provides strong support for the [RBALP] assay to predict oral RBA of arsenic in soil," and that this method has "several important attributes that make it highly suitable for risk assessment" (Diamond et al., 2016[4]).[5]

IVBA testing measures the soluble portion of a material in a simulated digestive tract as an indicator of the bioavailability of a chemical. It is significantly less time consuming in comparison to *in vivo* testing, yet it provides quantitative results that reliably estimate the relative bioavailability of arsenic and lead in environmental media. In prior discussions with U.S. EPA, Dr. Serda acknowledged that the RBALP method could be used to generate site-specific bioavailability estimates for lead and arsenic, which could be applied (in lieu of standard default values) in the Leviathan Mine Site human health risk assessment. While the method has only been endorsed by U.S. EPA for lead and arsenic, Atlantic Richfield believes that the preliminary testing results may also prove useful in assessing whether *in vivo* testing, which is substantially more complicated and time consuming, for other RI/FS metals would be informative for the risk assessment.

Atlantic Richfield will complete the preliminary IVBA testing in December 2016. Prior to collecting and analyzing any additional samples as part of a broader program, Atlantic Richfield will submit a Task Sampling and Analysis Plan to U.S. EPA for review and approval in first quarter 2017.

If you have any questions or comments, please feel free to contact me at (714) 228-6770 or anthony.brown@bp.com.

Sincerely,

Anthony R. Brown
Project Manager, Mining

Attachment:
Figure 1 Preliminary Bioaccessability Testing Samples – DSA Floodplain Soil (Reach 1)

[3] U.S. EPA. 2012. Standard operating procedure for an in vitro bioaccessibility assay for lead in soil. OSWER 9200.1-86. Method 1340, April.

[4] Diamond, et al., 2016, Predicting oral relative bioavailability of arsenic in soil from in vitro bioaccessibility, Journal of Toxicology and Environmental Health, Vol. 79, No. 4, 165-173.

[5] The meta-analysis is based on data for 84 paired animal and *in vitro* bioaccessibility analyses for soils of diverse sources and soil characteristics, using studies in one of three animal models, with RBA values ranging from 7% to 100%.

cc: Gary Riley, U.S. Environmental Protection Agency, Region 9 – via electronic copy
John Hillenbrand, U.S. Environmental Protection Agency, Region 9 – via electronic copy
Douglas Carey, Lahontan Regional Water Quality Control Board – via electronic copy
Nathan Block, Esq., BP – via electronic copy
Adam Cohen, Esq., Davis Graham & Stubbs, LLP – via electronic copy
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Grant Ohland, Ohland HydroGeo, LLC – via electronic copy
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Cory Koger, U.S. Army Corps of Engineers – via electronic copy
Greg Reller, Burleson Consulting – via electronic copy
Diane Vitols, Esq., Washoe Tribe of California and Nevada – via electronic copy
Fred Kirschner, AESE, Inc. – via electronic copy
Ned Black, U.S. Environmental Protection Agency, Region 9 – via electronic copy
Sophia Serda, U.S. Environmental Protection Agency, Region 9 – via electronic copy

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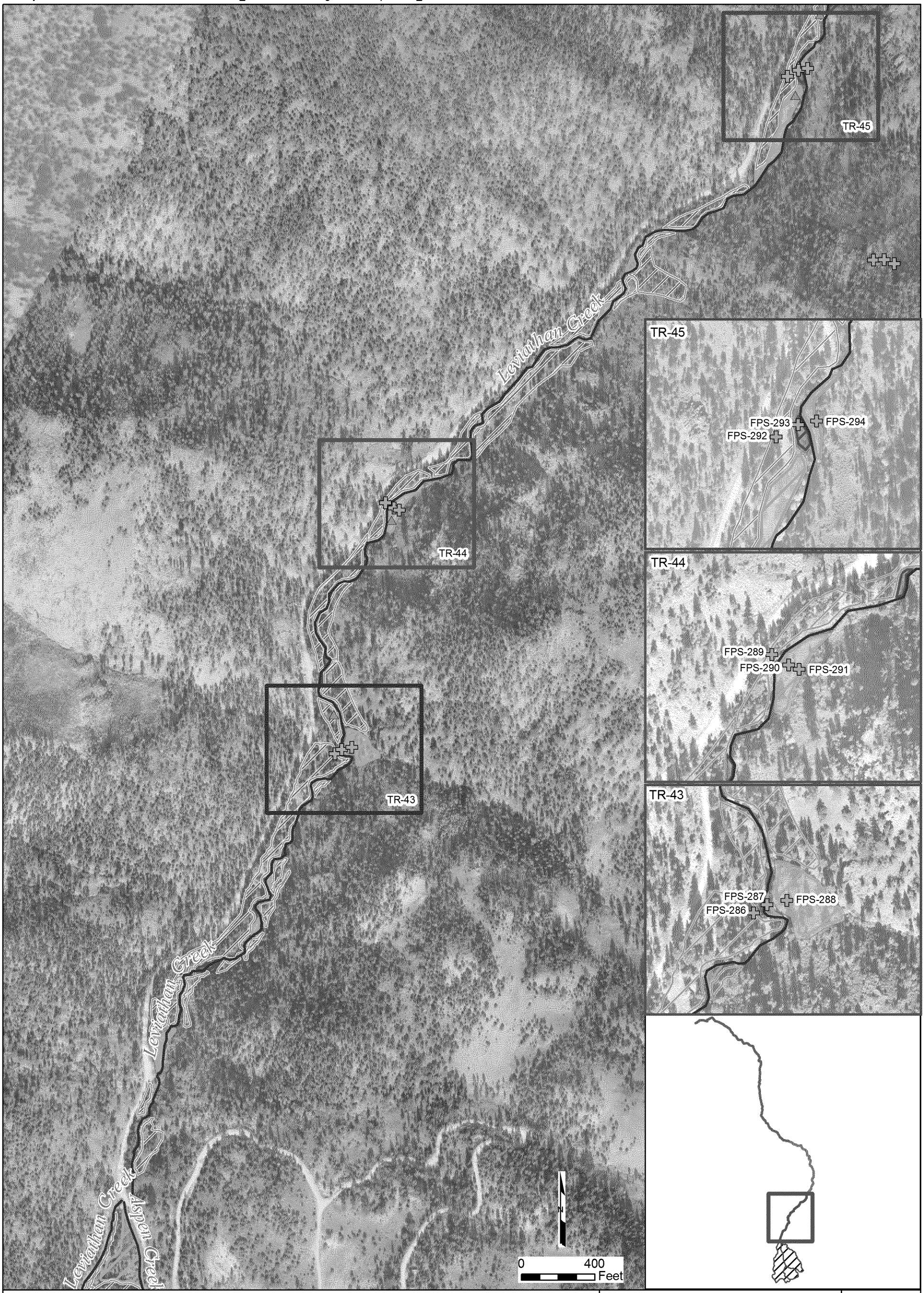

Explanation

- Analytical Sample Location
- SSCS Sample Location
- Reach #1
- Reach #2
- Reach #3
- Other Streams

Floodplain Soil Type

1	4A
2	5
3	6
3A	Beaver Pond
4	Inaccessible at Time of Mapping

Floodplain Age Category

1
2
3

Notes:
1. All locations and boundaries are approximate.
2. Base map from aerial photograph dated October 22, 2009 and 2013 ESRI, i-cubed, GeoEye.

PRELIMNIARY BIOACCESSIBILITY TESTING SAMPLES - DSA
FLOODPLAIN SOIL (REACH 1)
Leviathan Mine Site
Alpine County, California

amec foster wheeler

By: DPV
Date: 11/17/2016

Project No. 0013091

Figure 1

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